

REMARKS

This responds to the Office Action dated October 3, 2003. Claims 3-9 and 12-28 are pending in this case. Claims 1, 2, 10 and 11 have been canceled previously. Claims 4, 5, 8, 14, 15, 17, 22, 23, and 25 have been amended. Reconsideration of this application in view of the above amendments and the following remarks is respectfully requested.

In paragraphs 1-8 of this Office Action, claims 3-7, 9-16, 20-24, 26 and 28 were rejected under 35 U.S.C. § 102 (e) as being anticipated by U.S. Pat. 6,459,263 to Hawkes et al. ("Hawkes"). In addition, the Examiner indicated that claims 8, 17, 25 and 27 would be allowable if rewritten in independent form. Applicant wishes to thank Examiner Vargas for the indication of patentability.

With respect to the § 102 (e) rejection, applicant respectfully traverses, as it appears to be based on inaccurate reading of the Hawkes reference. In particular, independent claims 3, 12, 20 and 26 are patentable over the cited art at least because Hawkes fails to disclose, teach or even suggest: (1) constructing a time-domain averaged data train from a single-event measurement signal; and (2) averaging over two or more time intervals Δ_i , at least two intervals being different or of variable length.

More specifically, Hawkes does not disclose time-domain averaging of a single event measurement signal. To avoid any ambiguity as to the terminology used, applicant directs the Examiner's attention to Figs. 3 and 4 of this application, which illustrate the difference between single-event and multi-event data averaging. Multi-event averaging, also known as echo stacking, is known in the prior art and involves averaging over different events. This is also the type of averaging disclosed in Hawkes:

A typical NMR measurement is obtained by signal averaging a number of data acquisitions to improve the signal to noise ratio. In the case of motion containing one or more periodic components, using the output of the predictive filter, each of those data acquisitions can be triggered when the NMR tool is in approximately the same position, stationary or in the same state of motion, and the data averaged to improve the signal to noise ratio. col. 9, lines 34-41, which includes the disclosure relied upon in the Office Action.

Clearly, Hawkes teaches averaging over signals obtained at different measurements (events), each being triggered at a time when the tool is in approximately same position during its motion. Thus, if for purposes of illustration there are five measurements, using the echo stacking approach in Hawkes, one would compute the average amplitude and phase of the first echo signals in the five measurements, the amplitude and phase average of the second echo signals in the five measurements, etc. The result is a composite signal in which

statistical variations between different measurements are reduced. Such averaging improves the signal to noise ratio but, as pointed out at page 3, lines 33-35 of this disclosure, reduces the apparent spatial resolution of the measurements.

By contrast, this application is directed to time-domain averaging over single event measurements, which obviate this problem in one aspect of the disclosure. Thus, in the example above one, there is only one measurement. Averaging is done over echo signals in this measurement, and may for example include computing the average of the second, third and fourth echo signals in the measurement to obtain a single amplitude representative of these signals. This process is different from the echo stacking described above, which leads to different properties, as discussed in more detail in the background section of this application (for example at pg. 4, lines 28-35, the illustrations in Fig. 3, Fig. 6-7 and their description in this application). Accordingly, applicant respectfully submits that constructing a time-domain average over single event measurements, as recited in the rejected claims, is very different from multi-event stacking, as disclosed in Hawkes. Therefore, Hawkes cannot anticipate.

Furthermore, Hawkes does not disclose, teach or even suggest that time-domain averaging can be performed over different time intervals, as recited in independent claims 3, 12, 20, or over variable time intervals, as recited in claim 26. In particular, contrary to the assertion in the Office Action, in Figure 5 and its description at col. 10, ll. 14-28, Hawkes describes effects of the radial tool vibrations on the received pulse echo train rather than time-averaging over different time intervals. Specifically, Figure 5 shows that due to the tool vibrations a pulse echo sequence is better represented by non-uniformly spaced pulses 407b, 409b, 411b, etc. than pulses 407a, 409a, 411a, etc., which are spaced uniformly at intervals Δt . Notably, neither Figure 5 nor its description at col. 10, ll. 14-28 disclose time-domain averaging over different or variable time intervals.

Based on the foregoing, applicant submits that independent claims 3, 12, 20 and 26 of this application are patentable over the prior art of record and respectfully requests that the corresponding rejections be withdrawn.

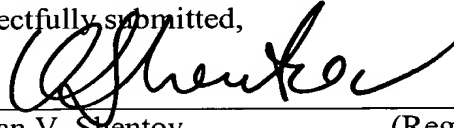
Applicant has amended claims 4, 5, 8, 14, 15, 17, 22, 23, and 25 to avoid a potential antecedent basis problem related to the use of time intervals Δ_i and Δ . No new matter has been introduced by this amendment.

Conclusion

On the basis of the above it is respectfully submitted that the present application is in a condition for allowance. A prompt action by the Examiner to this effect is respectfully requested. Should the Examiner have any questions or comments concerning this submission, or any aspect of the application, the Examiner is invited to call the undersigned at the phone number listed below.

Date: March 2, 2004

Respectfully submitted,



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